been fitted up in the General Post Office, with telegraphic instruments, in order that the clerks on the premises may learn to work them; and "dummy" instruments for the use of learners have been sent to the post offices in the provinces. The apparatus for common use will be the Morse printing telegraph and the single needle instrument; a wise selection, for long experience has proved them to be the best to place in the hands of unscientific clerks. They are not very liable to get out of order, and are very certain in their indications.

The following are among the changes that will be gradually made, some of them, however, at so distant a date that even the preliminaries have not been arranged as yet. The nine large district post offices in London will be made central stations, and each one will be connected by wire with the subordinate offices in its district. The chief post office in each of the largest provincial towns will be made a central telegraphic station, and the chief provincial towns will be placed in direct communication with three of the largest central London offices, namely, those in the West Central, Western, and South-western districts, in addition to the chief office in the East Central district. Suborbinate offices will be opened throughout the kingdom at the money-order offices in all places having a population of 2,000 persons and upwards. Messages will be received at all post offices for transmission by hand in the ordinary way to stations in connection with the telegraphic lines; pillar boxes will be places of deposit for messages written on stamped paper; and, as a rule, all messages will have to be paid for in stamps. The charge for transmission of a message of twenty words from any one part of the United Kingdom to any other part will be one shilling; but when it has to be delivered at a considerable distance from the nearest terminal station, it will be forwarded from that station by post for a penny, or by special messenger at sixpence per mile. Facilities will be given for the transmission of money-orders by telegraph, and as soon as possible the charges for messages to foreign parts will be reduced. Such are the plans which will be carried out, some of which will be in a very forward state in a few weeks' time.

THE GOLD FIELDS OF VICTORIA

The Gold Fields and Mineral Districts of Victoria. By R. Brough Smyth. (Melbourne: J. Ferres; London: Trübner and Co.)

II.

ALTHOUGH large quantities of gold are obtained from the detrital accumulations which overlie the palæozoic rocks of Victoria, there can be no doubt that they have come originally from the decomposition and removal of the auriferous quartz veins by which these rocks are traversed. The gold is simply a part of the detritus, in the same way that the fragments of quartz, sandstone, and slate are. Each nugget and bit of gold is only a more or less water-worn pebble, its edges being, as a rule, less worn, and its size larger, the nearer it is found to its parent reef. Yet some writers have endeavoured to show that the nuggets really grow by a kind of accretion, each fragment of gold becoming larger by successive depositions of the metal held in solution in the water percolating through the gravels. Mr. Brough Smyth, in discussing these and other disputed questions, usually avoids the expression of any decided opinion of his own. He treats them very much as a judge treats the evidence at a trial, and he leaves the decision to the jurymen, his readers. Yet we can very commonly guess what his opinions are, though he may not expressly state them. He gives us a tolerably copious account of opinions which have been published relative to the origin of quartz veins, and among these a valuable series of notes and sections specially made for him by a mining engineer of repute in the colony. The whole of this subject is, he says, involved in obscurity; "and though it is not possible for any one who has given attention to it to attach equal weight to the several theories which have been proposed, he would do wrong rashly to dismiss any of them as altogether improbable." Perhaps a judicial summing-up of this kind was, in the circumstances, better than the keen advocacy of any one theory. What is of value to the engineer in the colony is, to know what has really been written about the veins; and this he can learn with ease and satisfaction from Mr. Smyth's pages.

Allusion was made, in the previous notice of this volume, to the excellence of the geological and mining sections. It is rare to meet with such sections, so clearly conceived, so tastefully drawn, and carrying with them such conviction of their truth. The plate illustrative of the Ballarat gold fields is quite a model of clearness and clever drawing. No colour is used, but the various rocks are sharply defined, while, by the kind of drawing given to each, the internal structure of the mass is felicitously rendered. In the way of illustrations, the book seems to have only one failing, but it is a serious one: there is no geological map of the colony. The map at the end does not supply the want. A little coloured sketch-map, giving a general outline of the distribution of the geological formations, would have been an invaluable addition to the book, and would have certainly been worth a whole chapter of description.

One of the most striking facts brought out by the data compiled by Mr. Smyth is the high geological antiquity of the present land-surface of Victoria, or, in other words, the immense period during which that surface has remained above the sea. The palæozoic strata form the framework out of which the contour of the land has been moulded. These strata have been curved and folded, thrown on end, inverted, fractured, and upheaved. But the surface outlines are not found to bear any close relation to the direction of the subterranean movements. "There is scarcely one range in the colony which is not due to denudation, and those following lines of upheaval have been so modified by the action of water, through countless ages, as to make it difficult to determine where and how the elevating forces have operated." The palæozoic rocks were carved out into systems of valleys by the descent of rain-water from the watersheds to the lower grounds. Along these valleys river-gravels were laid down. In later times many volcanoes broke out, and thick streams of basalt rolled into the valleys and buried the ancient river-courses. Thus, in many places, the surface and the drainage of wide areas were wholly changed. New streams began to flow and to excavate new channels, which often flowed across the trend of the older valleys lying buried beneath them. By slow degrees these later valleys sank deeper into the frame-

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work of the country, often cutting down through the older water-courses. Speaking of Gippsland, the author remarks that the streams "have scooped out deep valleys. The lofty hills have not been upheaved in isolated masses, but are the remains of formations which have been swept away by the slow action of water. If all the rock-formations could be restored and placed in the positions which they once occupied, Gippsland would be an immense nearly level plateau. As a familiar illustration, we may liken the mountains formed of palæozoic rocks to the humps of earth left by the navvy when he digs a cutting The grass on the surface of the hump shows what was once the height of the ground which has been removed; and the recent tertiary formations on the tops of the hills in Gippsland are evidence of the original height of the whole area. The rocks which once occupied the intervening spaces have been eroded by water; and the height of the hills above the valleys affords some hint as to the vertical extent which has been cut away." The author believes that Victorian surface-geology affords "an answer to those geologists who have urged that the greater amount of erosion everywhere has been effected by marine agency, and not by rivers, rains, and the wasting action of the atmosphere." And, indeed, no one can study the maps and sections in this volume without being convinced that the erosion of the present and of the old valley-system has been wholly a sub-aërial process.

Mining operations have done a good deal towards elucidating the older system of water-courses which were overflowed and buried beneath basalt. These water-courses or "leads," as the miners call them, contain richly auriferous "drifts," and they are accordingly explored and ransacked by shafts and adits. Thus, at Ballarat, the river Yarrowee must have had its course shifted considerably eastward by the overflow of basalt. Its old winding channel has been explored under the overlying basalt, and the channels of its tributary rivulets from the east have been followed under the bed of the present river.

From the shafts and the natural sections along the sides of the valleys, we learn that the volcanic phenomena continued to manifest themselves for a prolonged period. Showers of ashes and streams of basalt were thrown out at long intervals, during which gravel and sand were accumulated in the water-courses above the last erupted materials. Hence we now find sections where sheets of basalt alternate with stream-gravel and with layers of clay and ancient soil. As in Auvergne, the lapse of time which separated the oldest from the most recent volcanic rocks cannot but have been great. On the one hand, some of the basalt plateaux have been trenched by valleys several hundred feet deep, and fragments of the plateaux have been left isolated; on the other hand, there occur craters and cones of ash so fresh that not many centuries may have passed away since they ceased to be in eruption.

But the changes of level effected by the outpouring of volcanic rocks at the surface have not been the only causes at work in greatly modifying the drainage of the country. In comparing the water-courses with the quantity of water flowing in them, still more in examining the endless lines of water-course in which there is no water at all, we are forced to conclude that the rainfall must be much less now than it was in a very recent geological period. Over a large part of Victoria the ground is low and sandy; and there the streams which come down from the hills, after wandering hopelessly about among pools and scrub, disappear altogether, being partly evaporated and partly absorbed into the parched soil. Mr. Smyth mentions an interesting fact when he says that the old drainage system of the country can often be traced only by the vegetation. "The Murray pine, in the midst of small Eucalypti, marks distinctly the line of the ancient water-courses." "The beds of old lakes and tributary creeks can now be discovered in some places only by the timber which they bear." This general desiccation of the country points to some wide-spread geological cause. Possibly it may be due—in part at least—to a comparatively recent elevation of the northern part of Australia, whereby the northerly winds, having a broad belt of land to pass over, lose much of their moisture before they reach the high lands of Victoria and New South Wales. The want of an abundant and constant supply of water is in some parts of the colony a serious obstacle to improvement. In particular, it operates most prejudicially upon gold-mining: no pains ought to be spared, therefore, to prevent the destruction of timber, and to take every opportunity of planting it where it is likely to be of service.

In conclusion, the volume which Mr. Smyth has produced, though too bulky and too detailed for general readers, is a storehouse of information on the subject of which it treats, and will undoubtedly take its place as one of the standard works of reference for all that relates to the occurrence and the mining of gold. ARCH. GEIKIE

OLIVER'S INDIAN BOTANY

First Book of Indian Botany. By Daniel Oliver, F.R.S., F.L.S., Keeper of the Herbarium and Library of the Royal Gardens, Kew, and Professor of Botany in University College, London. With numerous Illustrations. Small 8vo. pp. xii. and 394. (London: Macmillan and Co. 1869.)

THE want of special works introductory to the study of the botany of the principal tropical and southern countries of the globe has long been felt. The medical man, the student, and the amateur resident or travelling in India and our principal colonies, find it hard work to keep up or get up their botany by introductions and class-books founded on British plants, whilst the schoolmaster would find himself very much abroad who should attempt to teach his pupils Australian Botany by Henfrey's or Balfour's Introductions, or by Oliver's Elements. Hence the need of a series of works devoted to the teaching of botany with a special reference to the wants of the sojourners in foreign parts, and illustrated by the common plants to be found therein. With the exception of the admirable text-books of American Botany, of Asa Gray, we know of no work of the nature indicated, illustrative of any extra-European Flora. There was, indeed, some talk a few years ago of a series of such works, embracing all departments of Natural History, being authorised by the local governments of India,—but nothing has come from that quarter: and much as we then regretted the supineness of the Indian authorities in the matter, we no longer do so; for India could assuredly never have produced a work of so high an order as that whose title stands at the head of this notice, for a better considered

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